CLAIMS

1. An inkjet printhead assembly comprising:

a plurality of structures laminated together, one of the structures being a printhead having:

a plurality of nozzles;

a plurality of heater elements associated with each of the nozzles respectively, each heater element configured for thermal contact with a bubble forming liquid;

a plurality of ejectable liquid inlets in fluid connection with the nozzles;

such that,

heating the heater element above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a droplet of the ejectable liquid from the nozzle;

the remaining structures including a plurality of passages for the ejectable liquid, the passages extending from the ejectable liquid inlets on the printhead to openings configured for connection an ejectable liquid supply; wherein,

adjacent structures within the laminated structure are laminated together so that the passages funnel the ejectable liquid to the ejectable liquid inlets of the printhead.

2. The printhead assembly of claim 1 wherein each of the structures, apart from the printhead, are generally planar with openings to the passages on opposing sides, wherein the openings in the side of one of the structures are elongate, and the openings is the abutting side of the adjacent structure are also elongate; such that, the long dimension of the elongate openings in one side is angled relative to the long dimension of the openings of the abutting side.

3. The printhead assembly of claim 2 wherein the openings in at least one side of one of the structures is a series of channels.

4. The printhead assembly of claim 1 wherein the printhead is formed using lithographically masked etching techniques.

5. The printhead assembly of claim 1 wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

6. The printhead assembly of claim 1 being configured to print on a page and to be a page-width printhead.

7. The printhead assembly of claim 1 wherein each heater element is in the form of a cantilever beam.

8. The printhead assembly of claim 1 wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

9. The printhead assembly of claim 1 configured to receive a supply of the ejectable liquid at an ambient temperature, wherein each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point.

10. The printhead assembly of claim 1 comprising a substrate having a substrate surface, wherein the areal density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface.

11. The printhead assembly of claim 1 wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element.

12. The printhead assembly of claim 1 wherein the bubble which each element is configured to form is collapsible and has a point of collapse, and wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

13. The printhead assembly of claim 1 comprising a structure that is formed by chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

14. The printhead assembly of claim 1 comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure.

15. The printhead assembly of claim 1 comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another.

16. The printhead assembly of claim 1 wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

17. The printhead assembly of claim 1 wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point to cause the ejection of a said drop.

18. The printhead assembly of claim 1 wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless.

19. A printer system which incorporates a printhead assembly, the printhead assembly comprising:

a plurality of structures laminated together, one of the structures being a printhead having:

a plurality of nozzles;

a plurality of heater elements associated with each of the nozzles respectively, each heater element configured for thermal contact with a bubble forming liquid;

a plurality of ejectable liquid inlets in fluid connection with the nozzles;

such that,

heating the heater element above the boiling point of the bubble forming liquid forms a gas bubble that causes the ejection of a droplet of the ejectable liquid from the nozzle;

the remaining structures including a plurality of passages for the ejectable liquid, the passages extending from the ejectable liquid inlets on the printhead to openings configured for connection an ejectable liquid supply; wherein,

adjacent structures within the laminated structure are laminated together so that the passages funnel the ejectable liquid to the ejectable liquid inlets of the printhead.

20. The system of claim 19 wherein each of the structures, apart from the printhead, are generally planar with openings to the passages on opposing sides, wherein the openings in the side of one of the structures are elongate, and the openings is the abutting side of the adjacent structure are also elongate; such that, the long dimension of the elongate openings in one side is angled relative to the long dimension of the openings of the abutting side.

21. The system of claim 20 wherein the openings in at least one side of one of the structures is a series of channels.

22. The system of claim 19 wherein the printhead is formed using lithographically masked etching techniques.

23. The system of claim 19 wherein the heater elements are suspended in the bubble forming liquid.

24. The system of claim 19 wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

25. The system of claim 19 wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

26. The system of claim 19 being configured to print on a page and to be a page-width printhead.

27. The system of claim 19 wherein each heater element is in the form of a cantilever beam.

28. The system of claim 19, wherein the printhead is configured to receive a supply of the ejectable liquid at an ambient temperature, and wherein each heater element is configured such that the energy required to be applied thereto to heat said part to cause the ejection of a said drop is less than the energy required to heat a volume of said ejectable liquid equal to the volume of the said drop, from a temperature equal to said ambient temperature to said boiling point.

29. The system of claim 19 comprising a substrate having a substrate surface, wherein the areal density of the nozzles relative to the substrate surface exceeds 10,000 nozzles per square cm of substrate surface.

30. The system of claim 19 wherein each heater element has two opposite sides and is configured such that a said gas bubble formed by that heater element is formed at both of said sides of that heater element.

31. The system of claim 19 wherein the bubble which each element is configured to form is collapsible and has a point of collapse, and wherein each heater element is configured such that the point of collapse of a bubble formed thereby is spaced from that heater element.

32. The system of claim 19 comprising a structure that is formed by chemical vapor deposition (CVD), the nozzles being incorporated on the structure.

33. The system of claim 19 comprising a structure which is less than 10 microns thick, the nozzles being incorporated on the structure.

34. The system of claim 19 comprising a plurality of nozzle chambers each corresponding to a respective nozzle, and a plurality of said heater elements being disposed within each chamber, the heater elements within each chamber being formed on different respective layers to one another.

35. The system of claim 19 wherein each heater element is formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

36. The system of claim 19 wherein each heater element includes solid material and is configured for a mass of less than 10 nanograms of the solid material of that heater element to be heated to a temperature above said boiling point thereby to heat said part of the bubble forming liquid to a temperature above said boiling point to cause the ejection of a said drop.

37. The system of claim 19 wherein each heater element is substantially covered by a conformal protective coating, the coating of each heater element having been applied substantially to all sides of the heater element simultaneously such that the coating is seamless.

38. A method of ejecting drops of an ejectable liquid from a printhead assembly, the assembly having a plurality of structures laminated together, one of the structures being a printhead having:

a plurality of nozzles;

a plurality of heater elements associated with each of the nozzles respectively, each heater element configured for thermal contact with a bubble forming liquid;

a plurality of ejectable liquid inlets in fluid connection with the nozzles;

the remaining structures including a plurality of passages for the ejectable liquid, the passages extending from the ejectable liquid inlets on the printhead to openings configured for connection an ejectable liquid supply; wherein,

adjacent structures within the laminated structure are laminated together so that the passages funnel the ejectable liquid to the ejectable liquid inlets of the printhead;

the method comprising the steps of:

heating the heater elements to a temperature above the boiling point of the bubble forming liquid to form a gas bubble that causes the ejection of a drop of an ejectable liquid from the nozzles; and

supplying the nozzles with a replacement volume of the ejectable liquid equivalent to the ejected drops.

39. The method of claim 38 wherein each of the structures, apart from the printhead, are generally planar with openings to the passages on opposing sides, wherein the openings in the side of one of the structures are elongate, and the openings is the abutting side of the adjacent structure are also elongate; such that, the long dimension of the elongate openings in one side is angled relative to the long dimension of the openings of the abutting side.

40. The method of claim 39 wherein the openings in at least one side of one of the structures is a series of channels.

41. The method of claim 38 wherein the printhead is formed using lithographically masked etching techniques.

42. The method of claim 38 wherein the bubble forming liquid and the ejectable liquid are of a common body of liquid.

43. The method of claim 38 wherein the printhead is configured to print on a page and to be a page-width printhead.

44. The method of claim 38 wherein each heater element is configured such that an actuation energy of less than 500 nanojoules (nJ) is required to be applied to that heater element to heat that heater element sufficiently to form a said bubble in the bubble forming liquid thereby to cause the ejection of a said drop.

45. The method of claim 38 wherein prior to the step of heating the at least one heater element, a supply of the ejectable liquid, at an ambient temperature, is fed to the printhead, wherein the step of heating is effected by applying heat energy to the at least one heater element, wherein said applied heat energy is less than the energy required to heat a volume of said ejectable liquid equal to the volume of said drop, from a temperature equal to said ambient temperature to said boiling point.

46. The method of claim 38 wherein the printhead includes a substrate on which said nozzles are disposed, the substrate having a substrate surface and the areal density of the nozzles relative to the substrate surface exceeding 10,000 nozzles per square cm of substrate surface.

47. The method of claim 38 wherein the at least one heater element has two opposing sides and the bubble is generated at both of said sides of each heated heater element

48. The method of claim 38 wherein the generated bubble is collapsible and has a point of collapse, and is generated such that the point of collapse is spaced from the at least one heater element.

49. The method of claim 38 wherein the printhead has a structure that is less than 10 microns thick and which incorporates said nozzles thereon.

50. The method of claim 38 wherein the nozzles of the printhead are formed by chemical vapor deposition (CVD).

51. The method of claim 38 wherein the printhead has a plurality of nozzle chambers each chamber corresponding to a respective nozzle and a plurality of said heater elements are formed in each of the chambers, such that the heater elements in each chamber are formed on different respective layers to one another.

52. The method of claim 38 wherein the heater elements are formed of solid material more than 90% of which, by atomic proportion, is constituted by at least one periodic element having an atomic number below 50.

53. The method of claim 38 wherein the heater elements include solid material and wherein the step of heating at least one heater element comprises heating a mass of less than 10 nanograms of the solid material of each such heater element to a temperature above said boiling point.

54. The method of claim 38 wherein a conformal protective coating is applied to substantially to all sides of each of the heater elements simultaneously, such that the coating is seamless.